

## **Final Program Performance Report – September 29, 2005**

Project Title: Enhancements to the Prince William Sound Ocean Observing System

NOAA Award #: NA04NOS4730304      ADF&G COOP 05-047

Report Period: September 1, 2004-August 31, 2005

*Submitted by the Prince William Sound Science Center*

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*To the Alaska Dept. of Fish & Game through EVOS Trustee Council  
(for a grant awarded by the Coastal Services Center/NOAA)*

### **Summary**

This project addresses infrastructure expansion plans for the Prince William Sound Ocean Observing System (PWSOOS). Funds in this award were leveraged by multiple other sources to accomplish seven primary goals listed below. This award's funds were targeted at three of those seven goals, namely to:

- 1) deploy moored oceanographic buoys in Hinchinbrook and Montague Entrances to improve our understanding of the mechanisms and exchange rates of water between the Gulf of Alaska and the Sound
- 2) develop a real time data assimilation ROMS ocean circulation model to allow for a better understanding of the circulation patterns in PWS and water exchange mechanisms between the GOA and PWS to provide a solid scientific foundation for addressing fisheries and ecosystem management needs related to long-term oceanic and climatic variability.
- 3) improve the consistency and data quality from the existing array of meteorological sensors.

Work on these three goals has substantially been accomplished, as was planned for the first year. The oceanographic buoys are deployed in the two major entrances to Prince William Sound and, thanks to some cost savings, a third, smaller entrance (Prince of Wales Passage) also now has a moored buoy with an acoustic Doppler current profiler and conductivity, temperature and depth recorders. The buoys at Hinchinbrook and Montague will be maintained until 2010; the Prince of Wales Passage buoy is more temporary, for perhaps a year.

The ROMS ocean circulation model is well under development. An additional two years of work is planned and funds have been secured to accomplish this goal. In 2007, after the ROMS model is operational, a Lagrangian drifter buoy field experiment is planned, similar to a 2004 experiment organized by the Oil Spill Recovery Institute and Prince William Sound Science Center.

Five new meteorological sites were installed during the past year in Prince William Sound through a partnership with the Natural Resources Conservation Service. Additionally, a precipitation gauge was installed at a sixth site operated by the National Weather Service. This work was partially supported by funds from this award.

In June 2005 a workshop was held in Cordova to review the current components of the PWSOS and discuss extension of the system to include biological components. The

workshop report (attachment 1) provides summaries on the overall goals and includes individual one to two page reports by each principal investigator regarding their projects.

Additional enhancements to the PWSOS which we continue work on include:

- 4) deployment of precipitation gauges in the surrounding watersheds,
- 5) development of a synoptic wave model to predict wave heights, nearshore currents, and wave-induced turbulence,
- 6) collaborations with the Alaska SeaLife Center on marine mammal investigations,
- 7) coordination of a workshop to discuss how an ocean observing system can be used to monitor biological organisms in real time, and which organisms should be monitored to fully utilize the power of real time instrument arrays.

These latter goals and the continued expansion of the meteorological sensors is supported by multiple sources including a NOAA/COOPS award, the Oil Spill Recovery Institute, Prince William Sound Regional Citizens' Advisory Council and the Alaska Ocean Observing System.

#### **Activities - September 1, 2004 – August 31, 2005**

Work was completed as proposed within the three goals outlined above. Expenditures are commensurate with the amended budget (submitted April 11, 2005). A brief summary of work within each of the three goals follows. Also attached are:

- (1) "A Demonstration of the Alaska Ocean Observing System in Prince William Sound," a draft report compiled following the June 13-14, 2005 workshop. This report provides narrative and status reports about each of the components within the Prince William Sound Observing System.
- (2) "Prince William Sound Observing System Moorings," a powerpoint presentation detailing the deployment of five acoustic Doppler current profilers in Montague Strait, Prince of Wales Passage and Hinchinbrook Entrance.
- (3) Spring 2005 issue of The Breakwater (Prince William Sound Science Center newsletter), "Measuring ocean currents," page 2.
- (4) Fall 2005 issue of The Breakwater, "Prince William Sound Observing System Moorings," page 2, and "A demonstration of the Alaska Ocean Observing System" and "Components of the Prince William Sound Observing System," pages 4 and 5.
- (5) November 2004 issue of The Breakwater, "Oceanographic instrument added to mid-Sound buoy," page 1.

#### **I. Water exchange processes in Hinchinbrook Entrance and Montague Strait**

In order to improve our understanding of the magnitude and frequency of the exchange of water between the Gulf of Alaska and Prince William Sound, and the forces driving these exchanges, four acoustic Doppler current profilers (ADCPs) were deployed in mid-June at each of the two main entrances to the Sound. Additionally, an ADCP was deployed in Prince of Wales Passage, one of four smaller passages west of Montague Strait. The intent is to maintain the moorings in the two major entrances (Hinchinbrook and Montague) for five years, while the ADCP in the smaller passage may be periodically moved to gain data on water exchange in almost all of the Sound's waterways.

Three additional ADCPs were purchased to be mounted on the NOAA weather buoys already located in or planned for future deployment in the Sound. One was installed in the spring of 2004 on the West Orca Bay buoy (Buoy 46060) and the other two will be installed when NOAA does maintenance on their other buoys in the Sound.

Each of the subsurface moorings also have three conductivity-temperature records (CTDs) mounted at three different depths. Information from this program will be housed in the Prince William Sound Observing System (PWSOS) long-term oceanographic database and will be accessible through the Alaska Ocean Observing System (AOOS) and PWSOS web pages. The data will also be archived at the University of Alaska Fairbanks.

For further details about this component, see pages 8, 9, 17 and 18 of the June 2005 workshop report (attachment 1), and the powerpoint presentation detailing the deployment of ADCPs in June 2005 (attachment 2).

## **II. Data assimilation modeling**

Services of the Jet Propulsion Laboratory, University of California Los Angeles, were contracted with Raytheon Services Co. The scope of work attached to the contract outlines a three-year project to develop a real time data assimilation model for Prince William Sound applying the Regional Ocean Model System (ROMS). Funds for the second and third years of this contract are secured in other grant awards. ROMS is a free-surface, hydrostatic, primitive equation ocean model that uses stretched, terrain-following coordinates in the vertical and orthogonal curvilinear coordinates in the horizontal. The contractors worked with modelers at the University of Alaska Fairbanks. At the end of the three-year development period, plans are for the ROMS to be housed at the Alaska Supercomputing Center/UAF.

For further details about this component, see pages 12 and 24-26 of the June 2005 workshop report (attachment 1).

## **III. Improving data consistency and quality control for meteorological stations**

The original proposal envisioned an upgrading of seven meteorological stations deployed in 2002 by the Oil Spill Recovery Institute (OSRI) through the use of Iridium Short Burst Data service and partnering with the Natural Resources Conservation Service (NRCS) for quality control screening and data dissemination via the Internet. Further investigations determined more cost efficient methods for the data transfer than the Iridium system would provide.

In the spring and summer of 2005, SNOw TELelemetry (SNOTEL) sites were installed at two hatcheries located at Esther Island and Port San Juan (near Chenega Bay), and also at Tatitlek and Nuchek. The two hatchery sites and Tatitlek have a weather station and web camera reporting by satellite (<http://www.micro-specialties.com/pwscameras.asp>). The sites are recording wind direction and speed, total precipitation, barometric pressure, current, maximum, minimum and average temperature and solar radiation. At a National

Weather Station (NWS) site located on Seal Island, a storage precipitation gauge was added.

One additional sea level station will be installed next year at Strawberry Reef on the Copper River Delta. At elevation, one SNOTEL site was installed in September 2005 on Mt. Eyak, above Cordova. In 2006, three additional SNOTEL sites at elevation are planned for installation.

All of these sites' data will be made easily accessible later this fall/winter through the PWSOS website. Currently, data from Esther Island, Mt. Eyak, Port San Juan and Tatitlek can be accessed through the NRCS website, <http://ambcs.org/SiteViewer.shtml> The Seal Island station data is currently accessible through the NWS website: <http://pafc.arh.noaa.gov/obs.php>

For further details on this component, see pages 5 and 15 of the June 2005 workshop report (attachment 1).

#### **Project expenses**

See attached invoices 1-6.

Expenditures tracked the amended budget very closely.

## BUDGET Summary - Enhancements to the PWS Ocean Observing System - FINAL Report

Submitted to Coastal Services Center through EVOS Trustee Council

	Original Budget submitted May 2004		Revised Budget Jan. 31, 2005		Spent as of Aug. 31, 2005
	Direct Cost	Indirect Cost	Direct Cost	Indirect Cost	Direct Cost
<b>Salaries</b>					
Project manager - 1.7 months @ \$4,762	8,095		8,095		7,189
Marine technician - 1.5 months @ \$4,500	6,750		6,750		6,616
<u>Benefits</u>					
Project manager	3,238		3,238		4,133
Marine technician	2,700		2,700		2,755
<b>TOTAL Salaries &amp; Benefits</b>	<b>20,784</b>	<b>6,146</b>	<b>20,784</b>	<b>6,146</b>	<b>20,693</b>
<b>Travel</b>	-		-		
<b>Services / Contractual</b>					
Telephone	160		160		
Postage	125		125		
Computer network cost	1,000		1,000		
<u>Contracts</u>					
NASA Jet Propulsion Lab	150,000		150,000		
Natural Resources Conservation Service	-		19,295		
<b>TOTAL Services</b>	<b>151,285</b>	<b>7,772</b>	<b>170,580</b>	<b>13,478</b>	<b>170,919</b>
<b>Supplies/ Commodities</b>	<b>5,000</b>	<b>1,479</b>	<b>5,000</b>	<b>1,479</b>	<b>4,752</b>
<b>Equipment</b>					
ADCPs - two @ 31,745	63,490		63,490		40,056
ADCPs - ten @ 43,800	438,000		438,000		107,010
CTDs - three @ 4,000	12,000		12,000		257,502
Iridium phones for meteorological stations - 5 @ 5,000	25,000		0		92,580
<b>TOTAL Equipment</b>	<b>538,490</b>		<b>513,490</b>		16,342
					1 Thermosalinograph
<b>TOTAL Direct Cost</b>	<b>715,559</b>		<b>709,854</b>		<b>709,854</b>
<b>Indirect Cost - based on modified IDC of 29.57%*</b>	<b>15,397</b>	<b>15,397</b>	<b>21,102</b>	<b>21,102</b>	<b>21,102</b>
<i>IDC applies to all direct charges except:</i>					
IDC only applied to first \$25K of each contract					
IDC not applicable to equipment over \$5,000					
<b>TOTAL COS*</b>	<b>730,955</b>		<b>730,956</b>		<b>730,956</b>

\* MIDC reflects revisions based on financial statements for Oct. 1, 2002-Sept. 30, 2003